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COMMON VETCH AND ITS VARIETIES

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INTRODUCTION[1]

Common vetch (*Vicia sativa*) is a very variable species. Many of its variations have been described as species, others as botanical varieties. *Vicia angustifolia*, which is sometimes considered a subspecies of *Vicia sativa*, is here regarded as a distinct species. It is distinguished by its smaller flowers, which are 1.8 centimeters or less long, and pods without constrictions between the seeds and smooth and black at maturity.

The early use of common vetch as an agricultural crop antedates historic records. According to De Candolle (*1*)[2], the earliest reference to its culture was by Cato, about 60 B. C., when it was grown for both seed and fodder. It is native to the Mediterranean region and is now cultivated over a wide range of European territory. The oldest records indicate that it was introduced into the United States as early as the eighteenth century. Thomas Walter lists it in his Flora Caroliniana, 1788 (*9*). Later references to its presence in the United States are by Torrey in his Catalogue of Plants (*7*), which indicates that it was growing spontaneously in New York in 1819, and by Stephen Elliott (*2*), who in his Flora of South Carolina, Volume II, 1824, records that it was growing about Charleston, S. C., very abundantly.

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[1] All forage-crop work at Corvallis, Oreg., is conducted in cooperation with the Oregon Agricultural College and Experiment Station, and credit for the results obtained is hereby acknowledged as jointly due that institution.

[2] The serial numbers (*italic*) in parentheses refer to "Literature cited," at the end of this bulletin.

AREA ADAPTED TO COMMON VETCH

Common vetch is rather exacting with regard to temperature and soil conditions. The portions of the United States to which it is particularly adapted are limited. As a commercial crop it is confined to the region in Washington, Oregon, and California having mild winter temperatures. Only the most hardy varieties will survive the average winter of the South Atlantic and Gulf Coast States. Not enough experimental work has been done to determine the limitations of the several varieties in the last-named region, but it seems probable that when properly handled the most winter-hardy strains can be grown in limited areas at least.

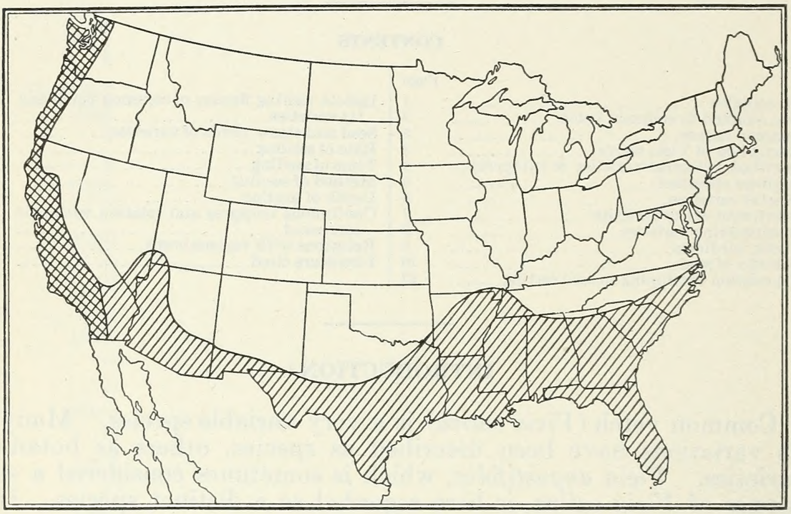

FIG. 1.—Map of the United States, showing by shading the region where common vetch should be fall sown. The double crosshatching indicates the region in which it does especially well. To most of the unshaded area common vetch is not well adapted and can be grown only as a spring-sown crop

General conditions in Arizona and adjacent territory are such that it is reasonable to expect common vetch to do well as a winter crop in this region. In irrigated areas at low elevations, however, it is rather difficult to get it to do well. This probably is due to the lack of inoculating organisms.

In all regions having winter temperatures approaching zero Fahrenheit, common vetch can be grown only as a spring-sown crop, and as yet it has not been found advantageous to seed it extensively in this way (fig. 1). It is used to some extent, however, in the North as a pasture and cover crop and as a hay crop in combination with the small grains. The imports of common-vetch seed received under the name of spring vetch have averaged 534,143 pounds annually since 1914 (Table 1), and this quantity probably is sown each season in the eastern United States.

TABLE 1.—*Imports of common-vetch seed into the United States from 1914 to 1923, inclusive*

Year	Pounds	Year	Pounds
1914	682,236	1921	542,400
1915	221,478	1922	344,600
1916	61,613	1923	1,858,100
1917	29,900		
1918	117,600	Total	5,341,427
1919	435,200	Average annual	534,143
1920	1,048,300		

COMMON NAMES

Several names have been used in designating *Vicia sativa.* Common vetch and spring vetch are names most frequently used for the commercial seed of this species. The latter name, however, has also been used to contrast the less winter-hardy with the more winter-hardy varieties, which are occasionally called winter vetch. Oregon vetch refers to the variety of *V. sativa* that is being grown in western Oregon and western Washington. A variety developed in Denmark has been put upon the market as crown vetch. Pearl vetch refers to a variety with pale-pink seed that has been commercialized under that name.

It seems desirable to avoid confusion that the group name common vetch be used for *Vicia sativa.* The other common names can then be used to designate the varieties. The term "winter vetch" can well be avoided in referring to *Vicia sativa,* as this designation is sometimes applied to *V. villosa.*

DESCRIPTION OF VICIA SATIVA

Plants with single stems in thick stands or with several stems from the crown if not crowded by other plants; stems semidecumbent or with support ascending, often branching; leaves with four to seven pairs of leaflets, each leaf bearing a terminal branching tendril; leaflets obovate, obcordate, cuneate, oblong to linear, the apex rounded, truncate, or incised; stipules semisagittate, usually serrate (entire in var. *remrevillensis*); flowers solitary or in clusters of two to four, usually two, sessile (rarely long pedicelled), corolla 2 to 3 centimeters long, purple, pink, or white; calyx with subequal teeth about as long as the tube; pods pale or dark brown in color at maturity, linear, terete, or compressed, pubescent or glabrous; seeds globose to lenticular, pink, reddish brown, mottled brown, or brownish black.

DESCRIBED BOTANICAL VARIETIES OR SUBSPECIES

Vicia sativa var. *alba* Beck (*V. alba* Moench): Leaflets obovate to obcordate; flowers white.
var. *amphicarpa* Coss. and Krol.: Plants bearing cleistogamous flowers; underground stems; normal stems with purple flowers.
var. *carnea* Beck: Leaflets obovate to obcordate; flowers light pink or rose color.
var. *cordifolia* Beck: Leaflets strongly obcordate, the apex deeply bilobed; flowers purple.
var. *cosentini* Arcang. (*V. cosentini* Guss.): Leaves cuneate to linear-obovate, 2 centimeters long and 6 millimeters wide; flowers purple; pods small, 6 millimeters in diameter, without pubescence, rough; seed mottled brownish and green.

Vicia sativa var. *erythrosperma* Reich.: Leaflets obovate to obcordate; flowers purple; seed reddish brown.

var. *glabra* Ser. (*V. glabra* Schleich.): Plant glabrous; flowers purple.

var. *grandiflora* Willk.: Leaflets obovate to obcordate; flowers about 3 centimeters long, purple.

var. *incisa* Boiss. (*V. incisa* M. Beib.): Leaflets deeply serrate; flowers purple.

var. *leucosperma* Ser.: Leaflets obovate to obcordate; flowers purple; seed pale pink.

var. *linearis* Lange: Leaflets narrowly linear to linear cuneate, 2 to 2½ centimeters long; flowers purple; pods small, 4 millimeters in diameter; brown when ripe. This is similar to *V. angustifolia* except for the larger flowers and brown pod.

var. *macrocarpa* Moris (*V. macrocarpa* Bertol.): Leaflets obovate to obcordate; flowers purple; pods large, 10 to 11 millimeters wide, very prominently net veined, dark brown when ripe.

var. *maculata* Burnat (*V. maculata* Presl): Leaflets obovate to linear-obovate, obtuse to truncate; flowers medium size, 1.7 centimeters long; pods not pubescent, small, up to 5 centimeters long and 4 to 6 millimeters wide, brown or brownish black. This is similar to *V. angustifolia* but differs in that the seed is mottled brown and green and the flowers average larger. It differs from var. *cosentini* in having finer stems.

var. *melanosperma* Reich.: Leaflets obovate to obcordate; flowers purple; seed mottled brown and black.

var. *nemoralis* Rouy (*V. nemoralis* Pers.): Leaflets linear-obovate, obtuse to somewhat truncate; flowers purple; pods small, 4 to 5 millimeters in diameter, brown when ripe.

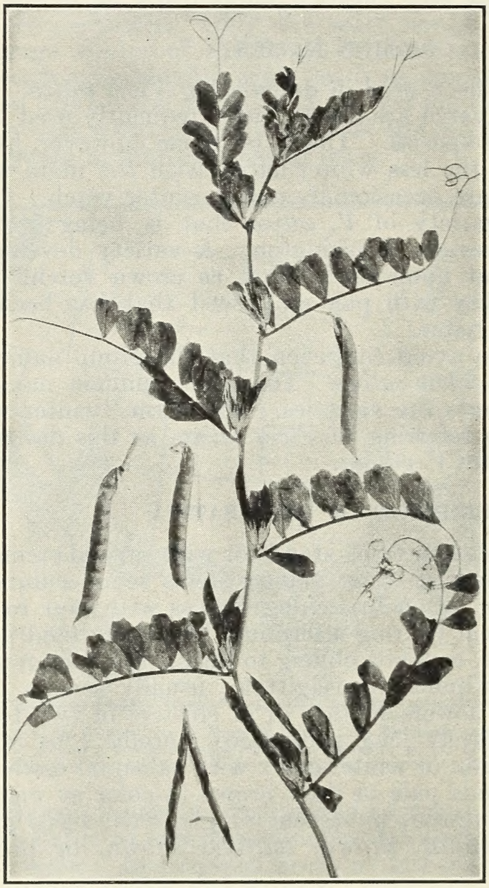

FIG. 2.—*Vicia sativa* var. *obovata* Ser., showing the upper portion of a stem and pods

var. *obovata* Ser.: Leaflets obovate to somewhat obcordate; flowers purple; seed mostly brown or black. This includes most of the common commercial varieties of *V. sativa*. (Fig. 2.)

var. *pygmaea* Ser.: Smaller in every way than *V. sativa obovata*; flowers purple. Probably a small form due to local conditions.

var. *remrevillensis* Huss.: Stipules entire; flowers purple.

var. *torulosa* Beck. (*V. torulosa* Jord.): Leaflets long, obovate to widely linear, truncate; flowers large, 2 centimeters or more long, purple; pods torulose, quite rough; seed yellowish, mottled with brown.

var. *triflora* Rouy.: Leaflets obovate to obcordate; flowers purple, three or four, nearly sessile or rarely on a peduncle up to 8 centimeters long.

Key to varieties

Plants with underground stems, bearing cleistogamous flowers	*Vicia sativa amphicarpa.*
Plants without underground stems, no cleistogamous flowers.	
Stipules entire	*V. s. remrevillensis.*
Stipules not entire.	
Pods 10 to 11 millimeters, reticulate	*V. s. macrocarpa.*
Pods 5 to 10 millimeters, not reticulate.	
Plants glabrous	*V. s. glabra.*
Plants not glabrous.	
Leaflets incised	*V. s. incisa.*
Leaflets entire.	
Flowers three to four	*V. s. triflora.*
Flowers one to two.	
Corolla white	*V. s. alba.*
Corolla colored.	
Flowers 3 centimeters long	*V. s. grandiflora.*
Flowers 2 to 2.5 centimeters long.	
Corolla pink	*V. s. carnea.*
Corolla purple.	
Pods 7 to 10 millimeters wide.	
Leaflets obcordate, apex deeply incised	*V. s. cordifolia.*
Leaflets obovate	*V. s. obovata.*
Leaflets obovate, seed red	*V. s. erythrosperma.*
Leaflets obovate, seed pale pink	*V. s. leucosperma.*
Leaflets obovate, seed dark	*V. s. melanosperma.*
Pods 5 to 6 millimeters wide.	
Leaflets truncate	*V. s. torulosa.*
Leaflets not truncate.	
Pods dark brown or brownish black	*V. s. maculata.*
Pods pale brown, at least not dark brown.	
Seeds mottled brown and green	*V. s. cosentini.*
Seeds not mottled brown and green.	
Leaflets linear-obovate, apex rounded	*V. s. nemoralis.*
Leaflets narrowly linear to linear-cuneate	*V. s. linearis.*

NUMBERS CLASSIFIED

For convenience of record the various Foreign Seed and Plant Introduction (S. P. I.) and Forage-Crop Investigations (F. C. I.) accession numbers used in this study are listed according to the foregoing classification. All numbers beginning with 0 (zero) are F. C. I. numbers, all others are S. P. I. numbers.

Vicia sativa var. *alba:* 02830.
- var. *carnea:* 17015, 17028, 18805, 31086. These varieties have reddish seeds like *V. sativa erythrosperma.* No. 31086 has flat seeds.
- var. *cosentini:* 16469.
- var. *erythrosperma:* 13415, 17012, 17021, 17029, 17034, 17790, 18134, 18135, 18803, 18804, 18814, 18818, 18819, 18823, 21196, 28315, 31080, 31082, 31087, 31092. All the foregoing have small seeds except 18134, 21196, 31082, and 31092; these are larger and are of a distinctly lighter shade of reddish brown.
- var. *leucosperma:* 04385, 16488, 31075, 31084.
- var. *linearis:* 18822, 31077, 31090.
- var. *macrocarpa:* 13425, 17024, 18138, 18813.
- var. *melanosperma:* 02831, 02992, 04324, 04432, 13407, 13420, 13427, 13430, 16452, 16462, 18141, 18338, 20570, 21197, 21363, 21519, 29086, 32195.
- var. *nemoralis:* 7717.
- var. *torulosa:* 21582, 21944, 25150.

VARIETAL VARIATION

There is a much greater diversity in *Vicia sativa* than might be concluded from the number of forms given under the heading "Described botanical varieties and subspecies." Within the different seed and flower color groups there are many varieties differing in size and shape of seed, season of maturity, producing power, pubescence on pods, shades of color in all parts of the plant, and other traits. Many of these characters are excellent by which to distinguish varieties. The color, size, and shape of the seed will often give sufficient information for varietal identification. While it is impossible to tell varieties with certainty from the seeds only, there usually is little difficulty in identifying commercial varieties if it is known that the seed under consideration is from a commercial source. This would preclude the possibility of its being one of the numerous noncommercialized sorts, which may resemble the commercial varieties in seed characters.

Seed of lentil (*Lentilla lens*) varieties can be easily confused with some of the *Vicia sativa* varieties. In such cases the resemblance is very close with regard to color, shape, size of the seed, and also the seed scar. This fact has been mentioned and illustrated by Vavilov (*8*, p. 85) in discussing the law of homologous series in related genera. Lentilla, like Vicia, seems to have been first mentioned by Wiegmann (*10*), who discusses the possibility of hybrid origin. He observed, however, that in the second and third generations there was no variation from the original seed sown. Gärtner (*5*, p. 424) notes Wiegmann's observations, but states that he does not believe the plants are hybrids. Focke (*3*, p. 515) later discusses this variety, calling attention to Wiegmann's observations, and agrees with Gärtner that it is not a hybrid. Vetch seed with lentil characteristics has been received from several sources by the United States Department of Agriculture and grown through a series of years. In no case has there been any tendency of the seed or the plants to vary from the original type. Fruwirth (*4*), in a recent study of a lentillike vetch seed, concludes that this is a good vetch variety with no relation to lentil.

Attempts to cross *Vicia sativa* varieties have always resulted in failures. Large numbers of flowers have been cross-pollinated by the writers through a series of years at Corvallis, Oreg., and Chico, Calif., but always with negative results. Whether or not these failures have been due to faulty technique can not be stated with certainty. It seems probable, however, that if vetches cross at all it is with extreme difficulty. A few cases of natural crossing of Vicia have been reported, but the conclusions have been based on very limited evidence. Gillot (*6*) reports the finding of a plant at Creusot, France, by P. M. Marchand that he considered a hybrid between *Vicia lutea* and *V. sativa* var. *angustifolia*. However, his conclusion was based not upon cultural tests but upon the fact that the specimen furnished by Marchand had characters of both species. It was given the name *Vicia marchandi* Gillot and Rouy after the discoverer. In the work covering a period of 15 years, during which time many species and varieties have been grown together, the writers have never found a plant that they considered of hybrid origin.

Although hybridization does not seem to offer much hope for the development of new forms of *Vicia sativa*, there are possibilities of improvement by selection. It seems probable that the many varieties now existing are due to mutations and that new forms can well be sought. All the variations noted in varieties of *V. sativa* breed true to form and suggest mutative origin. A large number of these have been included in the present study. From an agronomic standpoint the best are those making heavy growth and having good seed habits, winter hardiness, and aphis resistance.

DESCRIPTION OF THE VARIETIES

The best of the varieties included in this study are referred to by number in the agronomic data presented. Following is a description of these varieties, together with a statement of their distinguishing characteristics:

VICIA SATIVA ALBA

F. C. I. 02830.—Stems mid-stout, 6 to 12 dm. long, branching freely at the lower nodes, slightly pubescent; leaves 7 to 10 cm. long; leaflets 12 to 14, linear-ovate to linear-obovate, 22 mm. long, 8 mm. wide, mucronate, slightly pubescent on the under side; flowers two; calyx 4 mm. long, pubescent; corolla white, with darker veins in the standard, 20 to 25 mm. long; pods 5 or 6.5 cm. long, 8 mm. wide, slightly compressed, pubescent, 6 to 8 seeds; seeds globose, 3 mm. in diameter, mottled dark brown.

This is a white-flowered selection from Oregon vetch. It is somewhat later than this variety and does not dehisce so readily. It is characterized by rapid spring growth. This is a desirable variety for spring planting when late feed is desired or when for any reason fall seeding is not possible.

VICIA SATIVA MACROCARPA

S. P. I. 17024 and 18138.—Stems mid-stout, 6 to 12 dm. long; internodes 4 to 6 cm. long; leaves 8 cm. long; leaflets 12 to 14, obovate, somewhat truncate, 1½ to 3 cm. long, 7 to 14 mm. wide, slightly pubescent; flowers two, almost sessile, 2 to 2½ cm. long; calyx tube 3 to 5 mm. long; calyx teeth 5 to 7 mm. long; corolla purple; pods very large, not compressed, prominently reticulate veined, 5 to 6 cm. long, 10 to 11 mm. wide, dehiscing very easily, each containing 8 to 10 seeds; seeds large, 6 to 8 mm. in greatest diameter, dark solid brown or mottled brown and gray; cotyledons yellow; season early.

This early variety is readily distinguished by its large, very dark brown and prominently reticulate-veined pods. In the early seedling stage it can also be distinguished by its large and elongate leaflets. It is also characterized by a very high percentage of hard seed. This is not a desirable variety for general use, on account of light yields of both forage and seed. It may have value for obtaining a better strain with a high percentage of hard seed that will volunteer from year to year for pasturage or green manure.

VICIA SATIVA CARNEA

S. P. I. 18805.—Stems mid-stout, 6 to 9 dm. long, slightly pubescent; leaves 6 to 9 cm. long, 12 to 14 leaflets 12 to 20 mm. long, 5 to 10 mm. wide, linear-obovate to obovate; flowers pinkish white, the keel darker than the standard, 15 to 20 mm. long; pods pale brown, 4.5 to 5.5 cm. long, 6 to 7 mm. wide; seeds small, 3 to 4 mm. in diameter, reddish brown with distinct dark coloring around the hilum; season mid-early.

This variety is especially distinguished for having proved resistant to aphids. The pods shatter but little. While good yields of both forage and seed have been obtained from this variety, it is not so winter hardy as Oregon vetch and can not be recommended for use except in areas with milder winters than western Oregon. It will probably stand the winters in all parts of California and Arizona except the mountain areas.

VICIA SATIVA LINEARIS

S. P. I. 18822.—Stems fine to mid-stout, branching above, 6 to 10 dm. long; leaves 6 to 8 cm. long, leaflets 10 to 12, linear-obovate, obtuse or acute, 14 to 32 mm. long, 4 to 6 mm. wide; flowers two, lilac purple; pods glabrous, dark brown, 4 to 5 cm. long; 4 to 5 mm. wide, cylindrical, 8 to 10 seeds; seeds small, 2.5 to 3.5 mm. in diameter, dark brown or slightly mottled with gray; season very early.

This variety is especially distinguished by its narrow leaflets and by conspicuous branching near the top. The leaflets on the branches and on the upper leaves are small, pale in color, crowded, giving a clustered appearance which makes the herbage dense above. The pods shatter but little. The maximum growth of the plant compares favorably with other varieties, but the only point of superiority is its comparative freedom from shattering.

VICIA SATIVA TORULOSA

S. P. I. 21582.—Similar to 18822 (*Vicia sativa linearis*), but differs by having truncate leaflets. No. 21944 is another variety with this characteristic. Both make vigorous growth, but do not attain so large a size as some other varieties. The pods shatter but little, which is a desirable habit in a variety to be grown for seed.

VICIA SATIVA LEUCOSPERMA

F. C. I. 04385 and S. P. I. 31084.—Pearl vetch; stems mid-stout, 6 to 12 dm. long, slightly pubescent; stipules with white glands; leaves 6 to 12 cm. long; leaflets 12 to 15, 11 to 22 mm. long, 6 to 10 mm. wide, obovate to linear-obovate; corolla violet purple, 2 to 2.5 mm. long; pods 5 to 6.5 cm. long, 6 to 8 mm. wide, pubescent, very slightly compressed, 6 to 8 seeds; seeds 3 to 4 mm. in diameter, light pink.

Pearl vetch is readily distinguished by its light-colored seeds. It is less winter hardy than Oregon vetch and is especially adapted for spring seeding when or where such is necessary. The production of both hay and seed compares favorably with the heaviest producing varieties of common vetch.

VICIA SATIVA ERYTHROSPERMA

Stems coarse, 6 to 12 dm. long, pubescent; leaves 7 to 12 cm. long; leaflets 12 to 14, each 12 to 20 mm. long, 7 to 12 mm. wide, obovate, nearly glabrous; flowers 16 to 20 mm. long, purple.

S. P. I. 17021.—Flowers lilac purple, pods slightly pubescent, 5 cm. long, 6½ mm. wide; seed light reddish, round, 3½ mm. in diameter.

S. P. I. 18134.—Flowers violet purple; pods very pubescent, large, and somewhat compressed, 5 to 7 cm. long, 8 to 10 mm. wide, 6 to 8 seeds; seeds buff to pale buff, round, 4½ to 5 mm. in diameter.

Both 17021 and 18134 are strong-growing varieties. The former can not be distinguished readily from many other varieties with reddish seed; but the latter can be distinguished by the color of the seeds, which are also larger than those of most varieties otherwise similar.

VICIA SATIVA MELANOSPERMA

Stems mid-stout to coarse, leafy, slightly to prominently pubescent, little branched; leaves 5 to 16 cm. long; leaflets 12 to 16, each 1.5 to 2.5 cm. long, 5 to 18 mm. wide, obovate to obcordate; flowers two, 2.5 to 3 cm. long, calyx 14 mm. long, corolla violet purple; pods somewhat pubescent, 5 to 8 cm. long, 6 to 10 mm. wide, not compressed, each containing 5 to 8 seeds; seeds globose, 4 to 5 mm. in diameter, mottled brown and gray.

F. C. I. 02831.—Swedish sweet; a strain developed in Sweden. It makes a vigorous growth, but does not yield so much seed as Oregon vetch. The whole plant is prominently pubescent.

F. C. I. 02992.—Oregon vetch; a strain of common vetch that has been grown in western Oregon for the past 20 years or more. It is characterized by its winter hardiness in comparison with other varieties of common vetch and also makes a very vigorous growth. It is similar to what is known as the winter strain or *Vicia sativa* in European countries.

F. C. I. 04324.—Crown vetch; a variety received from Denmark. It is very much like 13420, 04432, and Oregon vetch. It is characterized by winter hardiness, but has no morphological features by which it can be readily distinguished from Oregon vetch and some others. In experimental trials it has yielded less seed than a number of other varieties.

S. P. I. 13420.—A variety especially characterized by its winter hardiness; closely resembles Oregon vetch, from which it can hardly be distinguished.

S. P. I. 13430.—Closely resembles Oregon vetch in most characters. The seeds are dark brown with few of the mottled-gray seeds common in Oregon vetch. This is an excellent variety. It makes a heavy growth and is earlier than Oregon vetch.

S. P. I. 16452.—This variety is without specially distinguishing characteristics. It has made a strong vigorous growth, indicative of value. It is much like Oregon vetch in general appearance.

S. P. I. 16462.—Similar to 16452 but about 10 days later.

S. P. I. 18141.—Very early maturing, being the earliest variety tested. The pods are very pubescent, rather large, and shatter but little. In general appearance it is like Oregon vetch.

S. P. I. 18338.—Like Swedish sweet vetch (F. C. I. 02831) in general appearance, but does not seem to have such good seeding habits as that variety. It makes good growth.

S. P. I. 7708.—Grown as a mixture of several varieties with pink, brown, gray, and olive-green seeds. All resemble Oregon vetch in general characters but make a less vigorous growth.

NONSHATTERING VARIETIES

The pods of most varieties of vetch dehisce very readily, which makes it somewhat difficult to harvest the seed. This is true of the common commercial varieties. Several noncommercial varieties dehisce tardily and retain their seed long after they are ripe. These varieties and their S. P. I. numbers are as follows: *Vicia sativa nemoralis* (7717), *V. sativa cosentini* (16469), *V. sativa linearis* (18822, 31077, and 31090), and *V. sativa torulosa* (21582, 21944, and 25150). These all have small pods and do not make quite so much vegetative growth as some other varieties.

WINTER HARDINESS

There is a marked difference in the winter hardiness of varieties. The most hardy will ordinarily stand a temperature of 8° F. The least winter hardy will stand about 15° F. The temperatures preceding and following a cold spell and the protection given the plants by snow or vegetation of course determine to a certain extent the degree of cold the plants will stand, but the above figures indicate what may be expected under average conditions. Oregon vetch, crown vetch, and Nos. 04432 and 13420 are the most winter-hardy varieties tested. Nos. 13427 and 18338 are winter hardy, but somewhat less so than the above. Other varieties that are moderately winter hardy are Nos. 13407, 13430, 16452, 16462, 16469, 17029, and 18813. Pearl vetch is not so winter hardy as Oregon vetch, and for this reason is usually sown in early spring. Some of the less winter-hardy varieties are Nos. 04385, 17021, 17024, 18134, 18141, 18805, 18822, 21582, and 31084. Most of these varieties make good vegetative growth under favorable conditions.

In experimental tests at Raleigh, N. C., Auburn, Ala., Arlington, Va., and Fayetteville, Ark., the comparative winter hardiness of varieties has been clearly indicated, and only the most hardy can be expected to survive the average winter in most of the Southern States. The varieties grown in European countries under the name "spring vetch" should be avoided in seedings in the Southern States.

The variety known as winter vetch is similar to Oregon vetch and is the only commercial variety to be obtained from Europe that is likely to prove of value for this region. It may be that in the past the unfavorable results of many tests of common vetch in the Southern States have been due to the use of unsuitable varieties, as it is probable that in most cases imported seed was used.

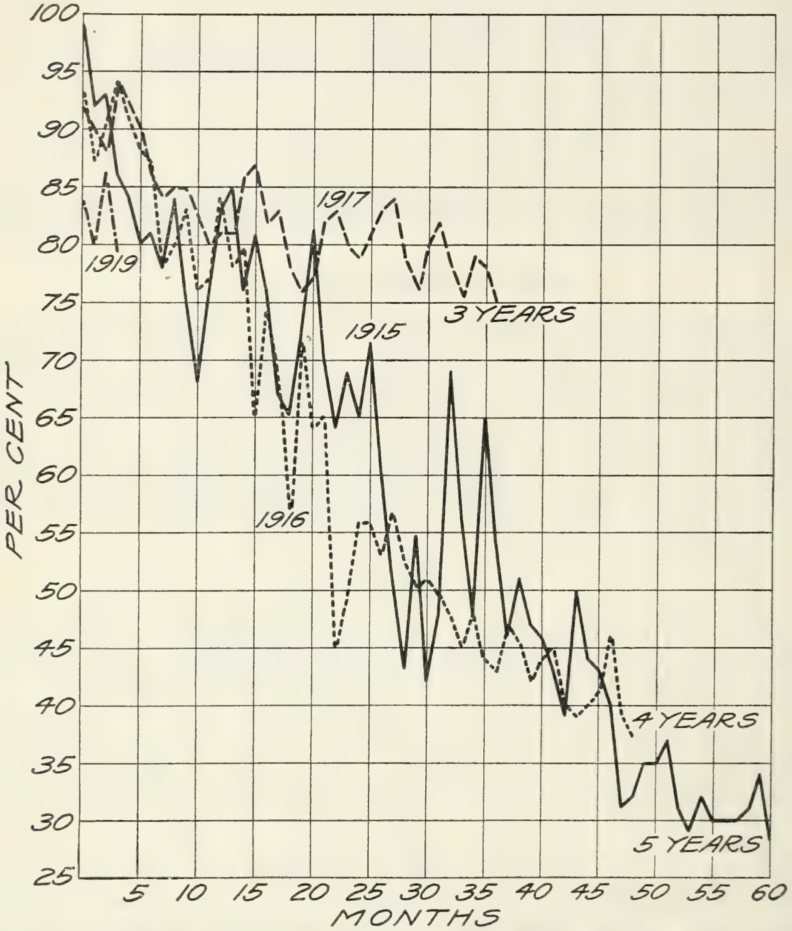

FIG. 3.—Diagram showing the percentage of hard seed in *Vicia sativa* var. *macrocarpa* and the decrease with age

VIABILITY OF SEED

The number of years that seed of common vetch will retain its vitality depends to some extent upon the conditions under which it is kept. Under average conditions it will diminish in vitality but little in six to eight years. In so far as tested, there is no difference in varieties in this respect. Table 2 gives the results of tests that have been made with seed varying in age from 1 to 20 years. The percentage of hard seed is at no time high except in the case of *Vicia sativa macrocarpa.* In tests at Corvallis, Oreg., the hard seed of this variety has ranged for various seasons from 60 to 99 per cent three months after harvest and diminished about 15 per cent during each subsequent year. The accompanying diagram (fig. 3) shows the rate of decrease in the percentage of hard seed in this variety for a period of five years. In all other varieties of common vetch the proportion of hard seed is small. In order to determine the relation of hard seed to age, tests were made each three months after harvest, as given in Table 3. These results show no change in the first 18 months. Table 4 shows that Oregon vetch seed germinates promptly and under favorable conditions more than 90 per cent germinates in the first three days. The temperature of the germinating chamber determines to some extent the rate of germination. Common-vetch seed will germinate in a temperature of 50° F. or lower, but at such low temperatures the germination is slower than at 60° or 70° F.

TABLE 2.—*Germination tests of the seeds of common vetch varying in age from 1 to 20 years*

Age	Crop year	Date tested	In germinator (days)	Germination test (per cent)		S. P. I. number
				Germinated	Hard seed	
1 year	1920	1921	10	100	0	----------
2 years	1919	1921	10	99	1	----------
4 years	1917	1921	10	100	0	----------
5 years	1916	1921	10	100	0	----------
6 years	1915	1921	10	99	1	----------
10 years	1911	1921	7	96	0	18141
14 years	1907	1921	7	10	0	18141
20 years	1901	1921	6	0	0	7708

TABLE 3.—*Germination tests of the seeds of Oregon vetch grown in stated years at various periods after harvesting*

Crop year	Time elapsed after harvesting (results in percentages)									
	3 months		6 months		9 months		12 months		18 months	
	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed
1914–15	100	0	98	1	98	0	99	1	99	
1915–16	97	2	97	3	100	0	98	1	97	2
1916–17	97	3	100	0	98	2	100	0	100	0
1918–19	100	0	100	0	98	2	100	0	100	0
1919–20	100	0	100	0	100	0	100	0	99	0
1920–21	100	0	99	1	100	0	100	0	100	0
1921–22	99	1	100	0	100	0	99	1	100	0
1922–23	100	0	--------	--------	--------	--------	--------	--------	--------	--------

TABLE 4.—*Tests of Oregon vetch seed made in October of stated years, showing years of growth and periods of germination*

[Results in percentages]

Year grown	In germinator (days)	1916		1917		1918		1919		1920		1921		1922		1923	
		Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed	Germination	Hard seed
1914–15	3	92	8	97	3	95	5	94	6	94	6	95	5	94	5	93	5
	10	98	2	99	1	99	0	100	0	100	0	99	1	99	0	96	2
	21	98	2	100	0	99	0	100	0	100	0	99	1	97	0	96	2
1915–16	3	83	17	88	12	96	4	92	8	98	2	97	3	97	3	90	3
	10	98	2	96	4	100	0	99	1	100	0	100	0	100	0	93	0
	21	99	1	97	2	100	0	100	0	100	0	100	0	100	0	93	0
1916–17	3	----	----	92	8	95	5	98	2	97	3	95	5	98	2	96	2
	10	----	----	97	3	99	1	100	0	98	2	100	0	100	0	96	2
	21	----	----	97	3	100	0	100	0	98	2	100	0	100	0	96	2
1918–19	3	----	----	----	----	----	----	89	11	92	8	94	6	95	5	97	3
	10	----	----	----	----	----	----	100	0	95	4	99	1	100	0	100	0
	21	----	----	----	----	----	----	100	0	96	4	100	0	100	0	100	0
1919–20	3	----	----	----	----	----	----	----	----	98	2	96	4	95	5	94	6
	10	----	----	----	----	----	----	----	----	100	0	100	0	100	0	98	2
	21	----	----	----	----	----	----	----	----	100	0	100	0	100	0	98	2
1920–21	3	----	----	----	----	----	----	----	----	----	----	97	3	96	4	93	7
	10	----	----	----	----	----	----	----	----	----	----	100	0	99	1	99	0
	21	----	----	----	----	----	----	----	----	----	----	100	0	99	1	99	0
1921–22	3	----	----	----	----	----	----	----	----	----	----	----	----	96	4	95	5
	10	----	----	----	----	----	----	----	----	----	----	----	----	100	0	100	0
	21	----	----	----	----	----	----	----	----	----	----	----	----	100	0	100	0
1922–23	3	----	----	----	----	----	----	----	----	----	----	----	----	----	----	94	6
	10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	100	0
	21	----	----	----	----	----	----	----	----	----	----	----	----	----	----	100	0

THE RELATION OF TRIPPING TO SEED SETTING

To determine whether or not tripping the flowers of different varieties of vetch is beneficial or essential to seed setting, plants were covered by tarlatan net cages just as they were coming into bloom (fig. 4). The pods forming from tripped flowers were compared with those from untripped flowers. Flowers in tight paper bags were also

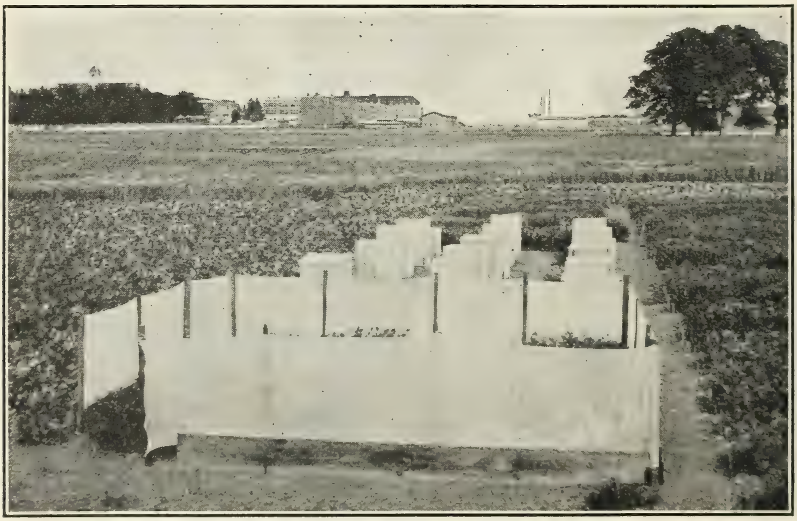

FIG. 4.—Tarlatan cages used in pollination studies

compared with flowers not bagged. The results of these experiments are shown in Table 5. Pods were readily formed in the paper bags, in the tarlatan cages, and outside, both when the flowers were tripped and when not tripped. However, the percentage of flowers setting pods when inclosed either in the paper bags or tarlatan cages was less than when they were left in the open under natural conditions. Of the flowers in the tarlatan cages tripped and not tripped, there was an increase in the percentage of pods set when the flowers were tripped. It seems apparent that the flowers are highly self-fertile but that tripping may have some slight effect in aiding fertilization. It is also apparent that inclosing the flowers in tarlatan cages and paper bags decreases to some extent the number of flowers setting pods.

TABLE 5.—*Pollination studies of vetch varieties, showing the relation of flower tripping to seed setting*

Varietal name	Plants inclosed in tarlatan cages							Plants not inclosed in tarlatan cages						
		Tripped			Not tripped				Not bagged			Bagged		
		Number of—			Number of—				Number of—			Number of—		
	Years of test	Flowers used	Pods set	Flowers setting pods	Flowers used	Pods set	Flowers setting pods	Years of test	Flowers used	Pods set	Flowers setting pods	Flowers used	Pods set	Flowers setting pods
				P. ct.			*P. ct.*				*P. ct.*			*P. ct.*
Leucosperma	5	286	226	79	313	214	68	2	68	68	100	52	27	52
Macrocarpa	7	142	113	79	144	112	78	3	39	38	97	46	18	40
Erythrosperma	5	125	117	93	166	142	85	2	61	59	96	52	27	52
Melanosperma	5	356	330	92	432	359	83	2	118	106	89	92	56	61
Oregon	6	343	310	90	408	285	70	3	113	112	99	92	58	63
Alba	5	194	169	87	341	252	74	2	57	53	93	63	43	68
Carnea	3	176	160	91	168	144	85	2	51	48	94	60	26	43
Nemoralis	1	14	14	100	36	32	88	------	------	------	------	------	------	------
Total	------	1,636	1,439	88	2,008	1,540	78	------	507	484	95	457	255	54

It is indicated by these experiments that insects that may trip the flowers are not essential to seed setting, though they may be somewhat beneficial. Crossing in common vetch does not seem to take place, and the benefit from tripping, if any, probably is that of a mechanical stimulus.

INSECTS VISITING FLOWERS OF COMMON VETCH AND ITS VARIETIES[3]

All varieties of *Vicia sativa* are rather free bloomers and nectar producers. The flowers are generally attractive and are easily worked by most insects in search of nectar or food. The stipules secrete substances that are collected and used by insects as food, and the presence of aphids draws numerous ladybird beetles, hover flies, and ants to the vetch plants in search of secretions or of the aphids themselves as food.

The following insects have been found actively engaged in working on *Vicia sativa* plants: Honeybees (*Apis mellifica*); bumblebees, many species; ladybird beetles, many species; flies, many species; hover flies (Syrphus and Eristalis); butterflies, many species; moths, many species; ants, many genera and species; aphids (*Microsiphium pisi*); thrips, many species.

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[3] This discussion is based solely on observations made by the junior writer at Corvallis, Oreg.

SEED AND STRAW YIELDS OF VARIETIES

The number of years that varieties of vetch have been grown in the experiments ranges from one to nine. Yields of both seed and straw have been obtained as given in Table 6. The spring seedings have given very poor yields, but the fall seedings are mostly good. The data are from seedings made at Corvallis, Oreg.

TABLE 6.—*Yields per acre of seed and straw of vetch varieties from fall and spring seedings*

[Computed from duplicate twentieth-acre plats. The asterisk (*) marks a year of crop failure]

Production and variety	Years of test	1915	1916	1917	1918	1919	1920	1921	1922	1923	Average
Seed, fall seeding:		*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
No. 02992	9	780	1,825	1,080	(*)	2,380	1,520	1,690	740	1,840	1,317
No. 18338	9	80	1,490	870	(*)	2,210	1,560	1,740	700	1,920	1,174
No. 02830	7	------	------	1,530	(*)	2,190	1,540	2,020	340	2,020	1,377
No. 04324 (crown)	7	320	1,050	720	(*)	------	1,040	1,500	------	1,740	910
No. 13430	6	------	------	------	1,038	1,500	2,480	2,380	(*)	2,240	1,606
No. 18805	6	------	------	------	1,116	1,960	2,160	2,622	(*)	960	1,470
No. 04385 (pearl)	5	------	728	570	------	------	2,400	2,280	------	1,800	1,556
No. 02831	4	------	------	------	------	------	1,320	1,810	360	1,740	1,308
No. 13420	4	------	------	------	------	------	2,240	2,200	580	2,070	1,773
No. 1652	4	------	------	------	------	------	2,310	2,020	300	1,720	1,588
No. 16462	4	------	------	------	------	------	2,700	2,560	330	1,800	1,848
No. 21582	4	------	------	------	------	------	1,800	1,720	320	1,840	1,420
No. 31084	4	------	------	------	------	------	2,010	2,100	(*)	1,970	1,520
No. 18134	3	------	------	1,125	------	1,760	1,900	------	------	------	1,595
No. 34947	3	------	------	------	------	------	960	2,020	------	1,920	1,633
Macrocarpa	3	------	810	725	------	------	------	------	------	850	795
No. 7708	2	------	550	440	------	------	------	------	------	------	495
No. 17021	1	140	------	------	------	------	------	------	------	------	140
Seed, spring seeding:											
No. 02992	3	0	------	245	------	------	------	------	0	------	82
No. 04385	5	120	1,150	450	------	------	------	530	220	------	494
No. 13430	1	------	------	480	------	------	------	------	------	------	480
No. 17021	1	140	------	------	------	------	------	------	------	------	140
No. 18134	1	------	------	435	------	------	------	------	------	------	435
Straw:											
No. 02830	5	------	------	3,680	4,400	4,620	4,060	5,380	------	------	4,428
No. 02992	5	------	------	3,620	3,740	4,340	5,280	5,800	------	------	4,556
No. 18338	5	------	------	2,020	3,660	3,780	5,540	6,460	------	------	4,292
No. 04324	4	------	------	4,080	3,940	------	4,560	4,420	------	------	4,250
No. 13430	4	------	------	------	3,860	3,800	4,820	4,820	------	------	4,325
No. 18805	4	------	------	------	3,380	3,700	5,260	4,580	------	------	4,230
No. 04385	3	------	------	3,420	------	------	5,500	5,420	------	------	4,780
No. 02831	2	------	------	------	------	------	6,180	6,000	------	------	6,090
No. 13420	2	------	------	------	------	------	4,020	5,800	------	------	4,910
No. 16452	2	------	------	------	------	------	4,880	5,780	------	------	5,330
No. 16462	2	------	------	------	------	------	6,300	5,600	------	------	5,950
No. 18134	2	------	------	------	------	4,240	5,900	------	------	------	5,070
No. 21582	2	------	------	------	------	------	4,800	5,280	------	------	5,040
No. 31084	2	------	------	------	------	------	6,360	6,120	------	------	6,240
No. 34947	2	------	------	------	------	------	5,940	5,560	------	------	5,750
No. 7708	1	------	------	3,060	------	------	------	------	------	------	3,060

RATE OF SEEDING

The best rate for seeding a crop varies with so many factors that a wide range of limits must be allowed. Experiments conducted at Corvallis, Oreg., for a period of seven years show that the heaviest yields of both hay and seed have been obtained from an intermediate rate of seeding (fig. 5). This has been the case both when vetch was seeded alone and when seeded with oats (figs. 6 and 7). The detailed results are given in Table 7. For western Oregon and western Washington the best rate of seeding seems to be 80 pounds of vetch when sown alone and 60 pounds of vetch and 40 pounds of oats when the two are used in combination (fig. 8). In California a lower rate of seeding is advised, because there is less winter damage there than in Oregon and Washington. For California 60 pounds of common vetch seed when sown alone and 50 pounds of vetch and 30 pounds of oats or other small grain are recommended. The best rate of seeding for the South Atlantic and Gulf Coast States is yet to be determined, but on account of the usual winter injury as heavy a rate as is used in Oregon likely will be required.

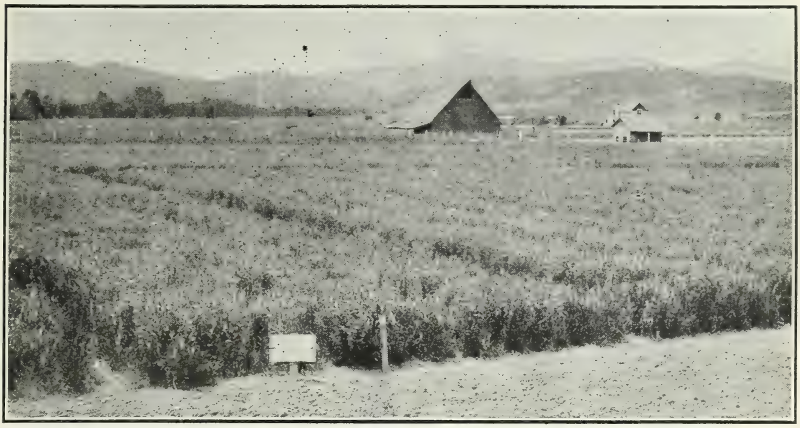

FIG. 5.—Plats of Oregon vetch in rate-of-seeding experiment

TABLE 7.—*Yields per acre of hay, seed, and straw from Oregon vetch when sown alone and in combination with oats at different rates of seeding*

[Computed from duplicate twentieth-acre plats. The asterisk (*) marks a year of crop failure]

Product and rate of seeding	1914–15	1915–16	1916–17	1917–18	1918–19	1919–20	Total	Average
Hay (dry-matter basis):	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
40 pounds	5, 180	6, 120	4, 460	2, 100	5, 880	5, 440	29, 180	4, 863
60 pounds	5, 480	6, 500	4, 860	2, 420	7, 540	6, 120	32, 920	5, 486
80 pounds	6, 100	6, 940	5, 560	2, 480	7, 800	6, 220	35, 100	5, 850
100 pounds	5, 880	6, 760	5, 300	2, 560	7, 640	5, 660	33, 800	5, 633
40 pounds oats with—								
40 pounds vetch	6, 080	7, 220	4, 740	3, 200	7, 260	5, 800	34, 300	5, 716
60 pounds vetch	6, 240	7, 960	5, 040	3, 740	8, 700	7, 000	38, 680	6, 446
80 pounds vetch	7, 580	7, 440	5, 180	3, 580	8, 040	6, 240	38, 060	6, 343
100 pounds vetch	6, 840	7, 500	5, 980	3, 320	7, 760	6, 280	37, 680	6, 280
Seed:								
40 pounds	1, 220	1, 240	1, 550	(*)	1, 619	1, 160	6, 789	1, 131
60 pounds	1, 333	1, 460	1, 850	(*)	2, 075	1, 259	7, 977	1, 329
80 pounds	1, 420	1, 814	2, 005	(*)	2, 120	1, 360	8, 719	1, 453
100 pounds	1, 267	1, 865	2, 050	(*)	2, 340	1, 090	8, 612	1, 435
Straw:								
40 pounds	--------	--------	4, 740	--------	6, 480	5, 440	16, 660	5, 553
60 pounds	--------	--------	5, 740	--------	7, 520	5, 320	18, 580	6, 193
80 pounds	--------	--------	4, 600	--------	7, 040	5, 680	17, 320	5, 773
100 pounds	--------	--------	4, 440	--------	7, 560	6, 080	18, 080	6, 026
SEED AND STRAW								
40 pounds oats with—								
40 pounds vetch								
Vetch	1, 140	1, 700	1, 520	(*)	1, 040	840	6, 240	1, 040
Oats	1, 120	1, 010	1, 148	(*)	1, 880	1, 660	6, 818	1, 136
Straw	--------	--------	6, 160	--------	8, 860	5, 200	20, 220	6, 740
60 pounds vetch								
Vetch	1, 520	1, 940	1, 750	(*)	1, 220	1, 000	7, 430	1, 238
Oats	1, 040	920	1, 130	(*)	1, 580	1, 380	6, 050	1, 008
Straw	--------	--------	5, 220	--------	8, 700	5, 160	19, 080	6, 360
80 pounds vetch								
Vetch	1, 680	1, 790	1, 940	(*)	1, 420	1, 180	8, 010	1, 335
Oats	1, 000	795	940	(*)	1, 520	1, 301	5, 556	926
Straw	--------	--------	3, 620	--------	7, 660	5, 620	16, 900	5, 633
100 pounds vetch								
Vetch	1, 200	1, 420	1, 870	(*)	1, 380	1, 080	6, 950	1, 158
Oats	1, 000	555	810	(*)	1, 360	1, 060	4, 785	797
Straw	--------	--------	5, 420	--------	7, 860	5, 520	18, 800	6, 266

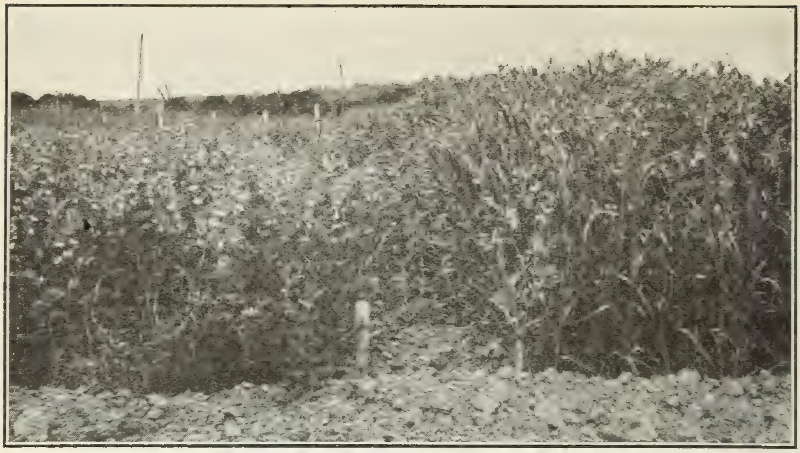

FIG. 6.—Oregon vetch grown alone (left) and in combination with oats (right)

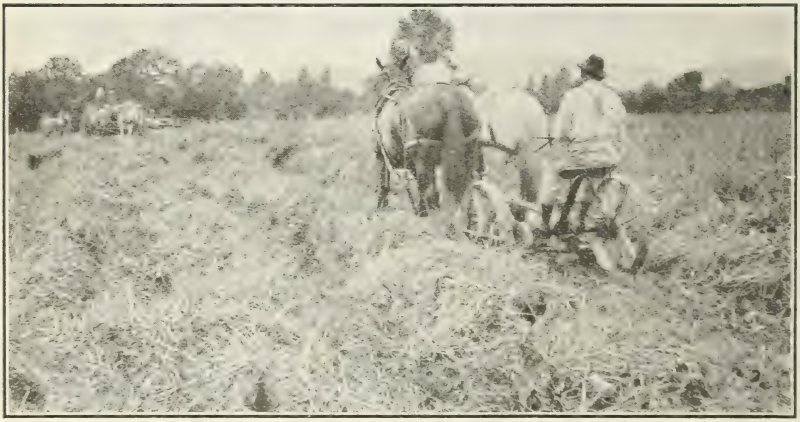

FIG. 7.—Cutting Oregon vetch and oats grown in combination

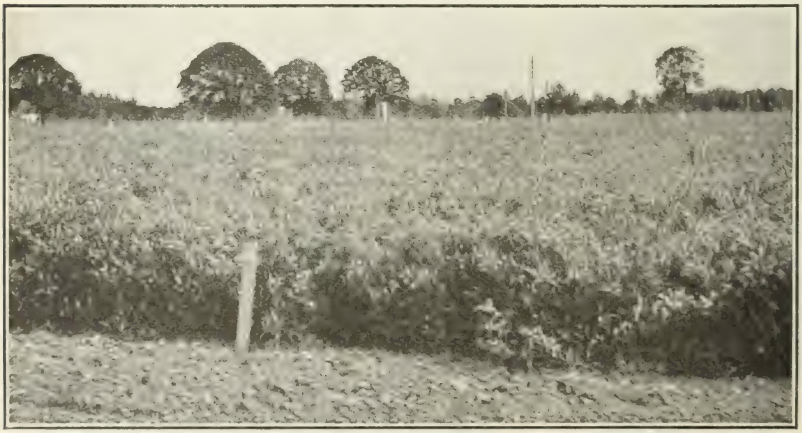

FIG. 8.—Oregon vetch sown at the rate of 80 pounds of seed per acre

TIME OF SEEDING

The results obtained at Corvallis, Oreg., by seeding at different times of the year are given in Table 8. It will be noted that good yields are obtained from all seedings except those of late spring. The seasonal weather conditions in western Oregon are such that the time of seeding necessarily varies, but early fall seeding is to be advised whenever possible. In California early fall seeding both for green manure and hay will give the best results. Common vetch requires a cool growing season. It is a winter crop in all regions with a mild climate, and the time of seeding should be such as to obtain the best advantage of the precipitation and moderate temperatures.

TABLE 8.—*Yields per acre of seed and hay of Oregon vetch as affected by time of seeding*

[Computed from duplicate twentieth-acre plats. The asterisk (*) marks a year of crop failure]

Product and time of seeding	1914–15	1915–16	1916–17	1917–18	1918–19	Total	Average
Seed:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
October		1,210				1,210	1,210
November		720	1,630	1,027		3,377	1,125
February-March	1,153	1,560	2,040			4,753	1,584
April	(*)	1,490	220	(*)		1,710	427
Hay (air-dry basis):							
October		5,660			3,780	9,440	4,720
November		4,920	7,080	4,990	3,260	20,250	5,062
February-March		5,130	6,060			11,190	5,595
April	(*)	5,620	700	(*)		6,320	1,580

METHOD OF SEEDING

The question is often asked whether drilling is better than broadcasting. The two methods were compared in experiments at Corvallis, Oreg., covering a period of three years. The results are given in Table 9. These data indicate that drilling is somewhat more advantageous, but it is questionable whether the experiment covered a period of years long enough to be conclusive. It has been suggested that drilling results in less winterkilling than broadcasting, but this question has never been determined. If winterkilling is a factor in the relative value of the two methods, different results would likely be obtained in regions where the winter weather is milder than at Corvallis.

TABLE 9.—*Yields per acre of Oregon vetch sown broadcast or drilled*

[Computed from duplicate twentieth-acre plats; hay yields computed on a dry-matter basis]

Year harvested	Planting date	Stand	Sown broadcast			Drilled		
			Seed	Straw	Hay	Seed	Straw	Hay
		Per cent	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
1915	Oct. 14	90	1,313		5,980	1,493		5,740
1916	Nov. 3	[1] 90	1,540		5,680	1,730		6,460
1917	Nov. 10	95	739	3,940	5,180	1,025	4,180	5,240
Total			3,592	3,940	16,840	4,248	4,180	17,440
Average			1,197	3,940	5,613	1,416	4,180	5,813

[1] The drilled plat had 100 per cent stand.

DEPTH OF SEEDING

In order to determine the effect of seeding at different depths, experiments covering a period of three years were conducted at Corvallis, Oreg. The data are given in Table 10. From this it is apparent that depth of seeding has nothing to do with yield; at least this is the case when the seeding depths are within the range of usual farm practice. The essential factor in depth of seeding is to obtain moisture conditions favorable to the germination of the seed.

TABLE 10.—*Yields per acre of seed and hay of Oregon vetch when seeded at various depths*

[Computed from duplicate twentieth-acre plats]

Product and depth of seeding	Date of seeding			Total	Average
	Oct. 14, 1915	Nov. 3, 1916	Nov. 10, 1917		
Seed:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
1 inch	1,590	2,065	1,025	4,680	1,560
2 inches	1,690	2,046	1,120	4,856	1,619
3 inches	1,610	2.040	1,200	4,850	1,617
4 inches	1,640	2,090	1,050	4,780	1,593
Hay (dry-matter basis):					
1 inch	5,300	6,400	5,560	17,260	5,753
2 inches	6,500	6,500	5,060	18,060	6,020
3 inches	6,440	6,660	5,340	18,440	6,147
4 inches	6,480	6,600	5,580	18,660	6,220

CONTINUOUS CROPPING AND ROTATION WITH OATS COMPARED

The data from experiments conducted at Corvallis, Oreg., comparing continuous cropping to Oregon vetch with rotations of Oregon vetch and oats are given in Table 11. On account of weather conditions the vetch-seed crop was a failure in 1918 and all the plats were harvested for hay. The difference between the yields of vetch seed on the continuously cropped plats and on the rotation plats was greater in 1916 than in 1920 or 1922, the heaviest yields being always on the rotation plat. However, the difference in the ratio of the yields was very slight. The ratio in 1916 was 1:1.098 and in 1920 and 1922 it was 1:1.100 and 1:1.166, respectively. These differences are very small and indicate that there has been no decrease in vetch-seed yield due to the continuous cropping. However, it is clearly indicated that there has been an increase in yield due to the rotation.

TABLE 11.—*Yields per acre of Oregon vetch under continuous cropping and in rotation with oats*

[Computed from duplicate twentieth-acre plats; hay yields computed on a dry-matter basis. The asterisk (*) marks a year of crop failure]

Year harvested	Planting date	Stand	Vetch continuously planted			Vetch rotated with oats			
			Seed	Straw	Hay	Crop	Seed	Straw	Hay
		Per cent	*Pounds*	*Pounds*	*Pounds*		*Pounds*	*Pounds*	*Pounds*
1915	Oct. 15	100	1,520		6,140	Oats	2,270		
1916	Nov. 4		2,285		7,980	Vetch	2.510		8,220
1917	Nov. 10	100	1,925	5,260	6,720	Oats	2,888	2,160	
1918	Oct. 3	100	(*)		2,520	Vetch	(*)		2,160
1919	Oct. 29	100	1,980	7,320	8,520	Oats	2,530	7,600	
1920	Oct. 6	100	1,200	4,920	6,980	Vetch	1,320	4,560	6,780
1921	Oct. 28	100	1,000	4,300	7,400	Oats	2,740	5,300	
1922	Oct. 21	100	960		4,100	Vetch	1,120		4,280
1923	Oct. 14	100	1,040		4,000	Oats	2.400		

ROTATIONS WITH VARIOUS CROPS

From 1915 to 1923 vetch was grown in rotation with oats, wheat, corn, and potatoes for comparison with continuous cropping to vetch. The data from these experiments are given in Tables 12 and 13. In considering the relative yields of vetch seed for the three years in which data are available it is clear that 75 per cent of the rotated plats gave an increased yield. It is also clearly indicated that there was no decrease in yield in the continuously cropped plats. The yield of vetch seed in 1922 on the continuously cropped vetch plat was 60 per cent of the yield in 1916; on the plat in rotation with oats, 55 per cent; on the plat in rotation with wheat, 64 per cent; on the plat in rotation with corn, 50 per cent; and on the plat in rotation with potatoes, 54 per cent. The lower yields in all the plats in 1920 and 1922 in comparison with 1916 no doubt were due to seasonal climatic conditions. From these data it seems apparent that rotation has been beneficial to seed yields of vetch and that oats is one of the best crops for this purpose, but at the same time continuous cropping to vetch has not decreased the yield.

In the hay yields given in Table 13 there is a decrease in the vetch when rotated with oats and an increase when rotated with corn. In the rotation with potatoes and wheat there was an increase in 1922 but a decrease in 1918 and 1920.

Table 12.—*Yields per acre of Oregon vetch under continuous cropping and in rotations with various crops*

[Computed from duplicate twentieth-acre plats; hay yields computed on a dry-matter basis. The asterisk (*) marks a year of crop failure]

Year grown	Vetch continuously planted		Crop	Vetch in rotation with—										
				Oats			Wheat			Corn			Potatoes	
	Hay yield	Seed yield		Seed yield	Hay yield	Crop	Seed yield	Hay yield	Crop	Seed yield	Hay yield	Crop	Seed yield	Hay yield
	Lbs.	*Lbs.*		*Lbs.*	*Lbs.*		*Lbs.*	*Lbs.*		*Lbs.*	*Lbs.*		*Lbs.*	*Lbs.*
1914–15	4,900	1,550	Oats	2,135	-----	Wheat	(*)	-----	Corn	-----	(*)	Potato	8,280	-----
1915–16	4,980	1,907	Vetch	2,305	4,920	Vetch	1,830	4,740	Vetch	2,340	5,760	Vetch	2,305	6,220
1916–17	4,520	1,395	Oats	2,695	-----	Wheat	2,268	-----	Corn	-----	15,340	Potato	11,580	-----
1917–18	2,580	(*)	Vetch	(*)	2,180	Vetch	(*)	2,160	Vetch	(*)	2,900	Vetch	(*)	2,120
1918–19	7,920	1,860	Oats	2,680	-----	Wheat	3,260	-----	Corn	-----	14,640	Potato	10,210	-----
1919–20	6,740	1,310	Vetch	1,400	6,020	Vetch	1,420	6,300	Vetch	1,100	7,280	Vetch	1,140	6,280
1920–21	7,040	1,080	Oats	2,610	-----	Wheat	3,130	-----	Corn	-----	15,000	Potato	7,870	-----
1921–22	4,280	1,140	Vetch	1,280	4,080	Vetch	1,180	4,460	Vetch	1,180	4,560	Vetch	1,260	4,500
1922–23	4,540	1,040	Oats	2,380	-----	Wheat	2,740	-----	Corn	-----	14,240	Potato	5,300	-----

Table 13.—*Relative yields per acre of seed and hay of Oregon vetch in various rotations*

[Computed from data in Table 12, assuming yields on the plats continuously planted to vetch at 1,000 pounds for seed and 5,000 pounds for hay]

Product and year	On plats continuously planted	On plats rotated with—			
		Oats	Wheat	Corn	Potatoes
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Seed yields:					
1916	1,000	1,208	959	1,227	1,208
1920	1,000	1,068	1,084	847	870
1922	1,000	1,113	1,026	1,026	1,095
Hay yields:					
1916	5,000	4,939	4,759	5,783	6,245
1918	5,000	4,225	4,186	5,620	4,108
1920	5,000	4,465	4,673	5,400	4,658
1922	5,000	4,764	5,208	5,324	5,254

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